FEDERAL - STATE - PRIVATE
COOPERATIVE SNOW SURVEYS

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
FEB. 1, 1970

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streomflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater chonge than those made on later dates.

The snow course measurement is obtained by sampling snow depth ond water equivolent at surveyed and marked locations in mountain areas. A totol of about ten samples are taken at each location. The averoge of these are reported os snow depth and water equivolent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are mode monthly or semi-monthly from January 1 through June 1 in most stotes. There are about 1400 snow courses in Western United States ond in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locotions.

Detailed data on snow course and soil moisture measurements are presented in stote and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at volley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record ore published by the Soil Conservation Service by stotes about every five years. Data for the current year is summarized in a West-wide basic dota summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservotion Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservotion Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portlond, Oregon 97209.

Copies of state ond local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	Room 345, 304 N. 8th. St., Boise, Idoho 83702
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevodo	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portlond, Oregon 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Woshington	360 U.S. Court House, Spokone, Washington 99201
Wyoming	P. O. Box 340, Casper, Wyoming 82601

PUBLISHED BY OTHER AGENCIES.

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P O Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Londs, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia

USDA-SCS-PORTLAND, OREG. 1966

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

FEBRUARY 1, 1970

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

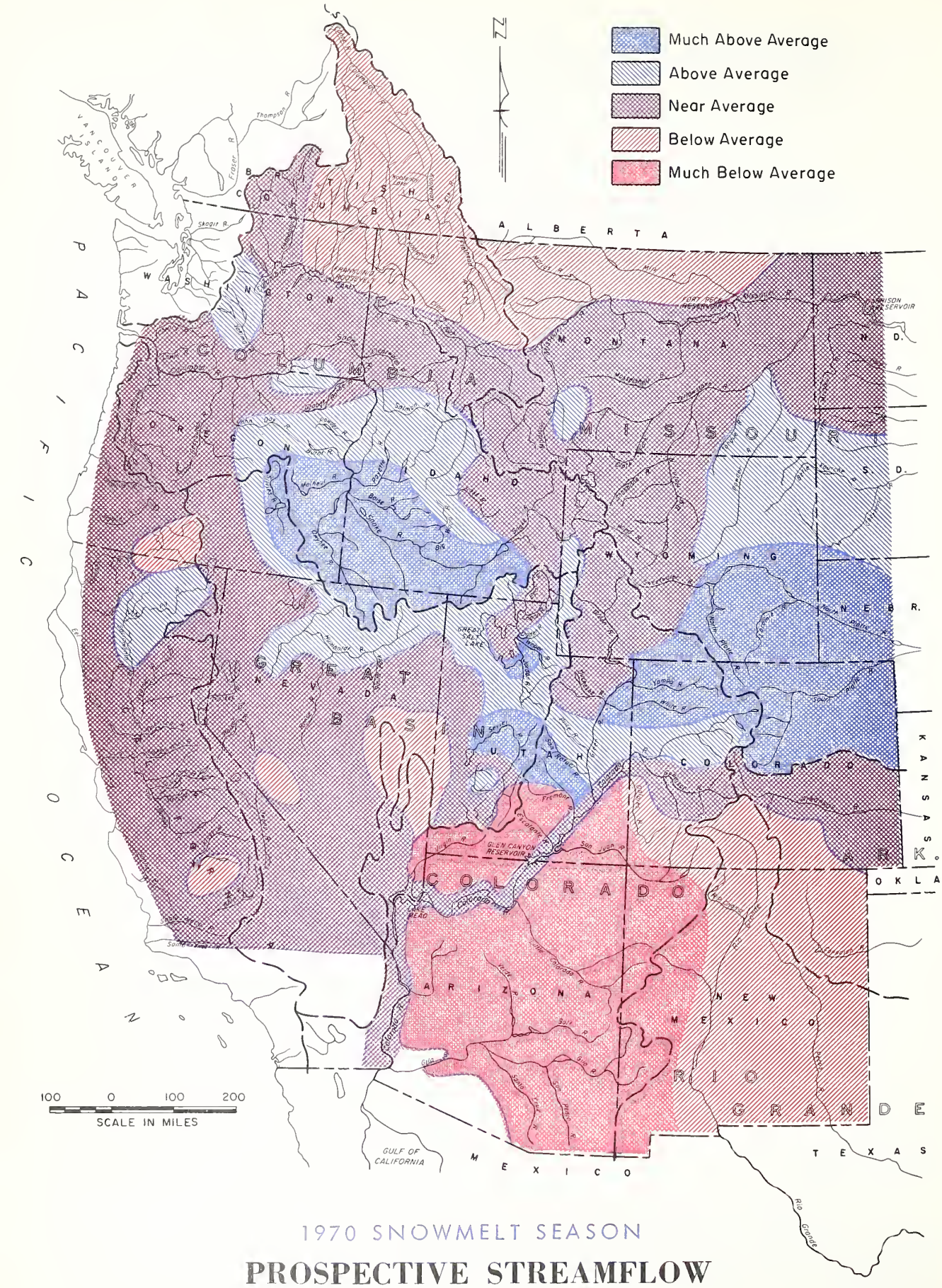
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR



1970 SNOWMELT SEASON

PROSPECTIVE STREAMFLOW

AS OF FEBRUARY 1, 1970

USDA-SCS-PORTLAND, OREG. 1968

WATER SUPPLY OUTLOOK

1970 SNOWMELT SEASON
AS OF FEBRUARY 1, 1970

NEAR OR ABOVE AVERAGE SNOWPACKS COVER MOST WESTERN WATERSHEDS. THIS CONDITION, COMBINED WITH GENERALLY EXCELLENT RESERVOIR STORED WATER, PROVIDES A SATISFACTORY WATER SUPPLY OUTLOOK FOR MOST MAJOR IRRIGATED AREAS. WATER USERS IN ARIZONA, ON THE PECOS RIVER IN NEW MEXICO AND IN EXTREME SOUTHERN UTAH WHO ARE ON NATURAL FLOW RIGHTS OR HAVE INADEQUATE RESERVOIR STORAGE RIGHTS CAN EXPECT LATE SUMMER SHORTAGES. STREAMS HERE ARE FORECAST AT ABOUT 40 TO 65 PERCENT RUNOFF.

January storms brought a major improvement in the water outlook for many areas of the west, where the new year had begun with light snowpacks. Storms were particularly heavy in California and the United States portion of the Columbia basin. Above average snows also fell in Montana, parts of Wyoming, central and northern Utah. The major storms stayed in northern areas, bypassing southern California, Arizona and New Mexico. Southern and eastern Utah, along with the San Juan, Rio Grande and southern tributaries to the Arkansas river in Colorado also missed the beneficial effect of these storms. To the north in British Columbia, January storms were also light, leaving lower than average snowpacks.

Temperatures associated with the January storms were very warm, setting new records in places. Storms were frequent for about 20 days during midmonth, with considerable rain at the higher elevations. Snowpacks are generally much denser than normal for this time of year and will contribute to earlier than normal spring runoff unless temperatures during the spring months are cooler than usual. Snowmelt from the warm temperatures and heavy rains contributed to higher than normal streamflow and inflow to reservoirs.

The California Department of Water Resources reports that despite exceptionally warm storms during January, the remaining snowpack in the upper regions of the Cascade and Sierra watersheds is such that near or above normal spring runoff is forecasted for these streams. Reflecting the record precipitation of January and the large carryover from last year, storage in most of California's major reservoirs is much above normal for this date. January storm patterns had little effect on the area south of the Tehachapi Mountains which again is experiencing relatively dry conditions.

The snowpack on the upper Columbia and Kootenai rivers in British Columbia and the Flathead river in Montana varies from about 60 to 80 percent of average. Light snow cover also extends east of this area across the Marias and Milk rivers in Montana.

In Arizona the snowpack is nearly nonexistent, varying from virtually zero on the Verde watershed to 30 percent of average on the Little Colorado river. Fortunately, storage in the Salt River Project reservoirs is a third above average and will supply adequate water. Considerable pumping of ground water will be required along the upper Gila river and on the San Carlos Project.

Additional snowfall is needed on the watersheds of the Rio Grande basin to improve the presently deficient snowpack. Present runoff prospects vary from about 65 percent for the Pecos river, near 75 to 80 percent on the Conejos and Chama rivers, to near 85 to 90 percent on the upper Rio Grande in Colorado. The San Juan and Virgin rivers in southern Colorado and Utah can expect near 60 to 65 percent of average flows.

Most of the rest of the west currently have prospects of spring and summer streamflow which will be within 15 percent of average or considerably better.

Areas where the water outlook is especially favorable include eastern Oregon, southwestern Idaho, northeastern Nevada, central and north central Utah, the northern half of Colorado and the eastern half of Wyoming and the Sacramento river in California. Most streams

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS FEBRUARY 1, 1970

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	49	94
Madison	71	107
Gallatin	122	154
Missouri Main Stem	46	80
Yellowstone	78	99
Shoshone	81	105
Wind	81	100
North Platte	129	153
South Platte	159	164
ARKANSAS BASIN		
Arkansas	125	145
Canadian	---	---
RIO GRANDE BASIN		
Rio Grande (Colo.)	71	73
Rio Grande abv.Otowi Bridge	46	64
Pecos	27	23
COLORADO BASIN		
Green (Wyo.)	92	115
Yampa - White	98	132
Duchesne	53	89
Price	60	115
Upper Colorado	118	152
Gunnison	93	123
San Juan	47	65
Dolores	74	116
Virgin	18	56
Gila	11	11
Salt	18	23
GREAT BASIN		
Bear	89	114
Logan	96	108
Ogden	76	106
Weber	76	120
Provo - Utah Lake	56	99
Jordan	87	126
Sevier	49	79
Walker - Carson	54	116
Tahoe - Truckee	72	95
Humboldt	82	120
Lake Co. (Oregon)	43	84
Harney Basin (Oregon)	80	139
UPPER COLUMBIA BASIN		
Columbia (Canada)	70	70
Kootenai	60	62
Clark Fork	66	94
Bitterroot	78	111
Flathead	60	82
Spokane	60	99
Okanogan	76	95
Methow	74	111
Chelan	61	81
Wenatchee	82	131

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	88	117
Snake above Hiese, Idaho	90	118
Snake abv.American Falls Res.	83	121
Henry's Fork	70	109
Southern Idaho Tributaries	105	163
Big and Little Wood	52	101
Boise	78	138
Owyhee	67	154
Payette	90	147
Malheur	117	167
Weiser	93	136
Burnt	115	157
Powder	104	137
Salmon	76	117
Grande Ronde	87	108
Clearwater	70	84
LOWER COLUMBIA BASIN		
Yakima	91	134
Umatilla	65	94
John Day	100	132
Deschutes - Crooked	65	91
Hood	43	100
Willamette	53	78
Lewis	47	82
Cowlitz	62	86
PACIFIC COASTAL BASIN		
Puget Sound	66	91
Olympic Peninsula	57	74
Umpqua - Rogue	47	69
Klamath	34	55
Trinity	50	120
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	55	125
Feather	45	115
Yuba	30	75
American	45	110
Mokelumne	45	110
Stanislaus	45	115
Tuolumne	45	120
Merced	35	100
San Joaquin	35	100
Kings	30	100
Kaweah	25	90
Tule	35	70
Kern	35	100

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1953-67 period. California averages are for the period 1931-65.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

in these areas are expected to yield from about a fourth to over two-thirds more than their average amounts.

Storage in principal irrigation reservoirs is near average or above in all states of the West except Washington.

MISSOURI BASIN

The present snowpack shows considerable variability on the upper Missouri river and its tributaries in Montana. While drainages along the Continental Divide north of Helena have a snowpack that is about 30 percent average, along the lower two-thirds of the Gallatin river drainage the snow cover is heavy -- about 150 percent average. Snow on the Jefferson river is about 5 to 10 percent below average, while on the Madison river it is about the same percent above average.

Watersheds of the Yellowstone, Shoshone and Wind rivers all have snowpacks which are average or a little better. This also applies to watersheds on the west slope of the Big Horn mountains. On the north and east slope of the Big Horns, it is much heavier, resulting in streamflow forecasts of 129 and 137 percent average for the Tongue and North Fork Powder rivers, respectively.

In southern Wyoming and northern Colorado the snow cover is also very heavy for this time of year. The North Platte and Laramie rivers show about 150 percent normal, while the South Platte in Colorado recorded about 165 percent.

Moisture in the soils underlying the snowpack is generally below to well below average in Montana and Wyoming. In Colorado conditions improve, with soils having an average or above average moisture condition.

The flow of streams in Montana is expected to be a little below average on the Jefferson, 5 to 10 percent above average on the Madison and Yellowstone rivers, and 20 to 30 percent above on the Gallatin. Definitely below average runoff is also anticipated from streams north and west of the Missouri.

In Wyoming the flow of the Shoshone, Wind and Big Horn and Sweetwater rivers is anticipated to be average to 10 percent above. The North Platte and Laramie rivers, as well as all tributaries of the South Platte river in Colorado are forecast to produce between 140 and 150 percent of average during the snowmelt season.

Carryover reservoir storage is near normal in Montana, a little below average on the North Platte and Wind rivers in Wyoming, and above average in the reservoirs of the South Platte river system.

ARKANSAS BASIN

The main headwaters of the Arkansas river have an above normal snowpack. However, the snow and water outlook situation becomes progressively less favorable on its southern tributaries, the Cucharas and Purgatoire, and in New Mexico on the Canadian river. Mountain and valley soil moisture is normal or better.

The Arkansas river at Salida is expected to yield slightly better than average flow, while prospects for the Purgatoire are down to about 20 percent less than average. Storage in John Martin reservoir is 11 percent of capacity. Ordinarily it holds 23 percent of its capacity at this time of year. In New Mexico, storage in Conchas reservoir on the Canadian river is considerably better, with 84 percent of capacity compared to the average condition of being 60 percent full.

Considering the light snow conditions in the southern portions of the basin, an above normal snowpack accumulation during the balance of the season is needed to assure adequate water supplies for next summer.

RIO GRANDE BASIN

The snowpack is deficient over all the watersheds of the Rio Grande basin. On the upper headwaters in Colorado it is about three-fourths average, and decreases sharply to the south. On the Pecos river in New Mexico it is only about one-fourth average. Many snow courses in northern New Mexico are approaching a minimum of record. Mountain soil moisture is good on the Pecos and Rio Grande drainages, but is poor on the Chama and Red River where soils are dry.

Flow of the Rio Grande near Del Norte is expected to be 10 to 15 percent less than average. Inflow to the river system from the Conejos and Chama rivers should be near 75 to 80 percent of their usual amounts. Surface runoff water supplies for the Pecos are expected to be less favorable, with a forecast of only 63 percent average.

Reservoir storage is near normal in the Rio Grande basin, except in Elephant Butte reservoir which holds 150 percent of the normal amount. Storage on the Pecos river is also near normal.

COLORADO BASIN

The present snowpack in the Upper Colorado river basin shows considerable variation. Fortunately for the total river system the heaviest snowpack lies on the areas of the basin which regularly produce the largest

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) APRIL - SEPTEMBER as of FEBRUARY 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
UPPER MISSOURI			
Jefferson at Sappington, Montana			
Madison near Grayling, Montana 1/			
Gallatin near Gateway, Montana			
Missouri near Landusky, Montana 2/			
Sun at Gibson Dam, Montana 3/			
Marias near Shelby, Montana 4/			
Milk near Eastern Crossing Montana			
Yellowstone at Yellowstone Lake Outlet, Wyo. (Apr-Oct.)	878	105	
Yellowstone at Corwin Springs, Montana			
Clark Fork at Chance, Montana			
Shoshone, Inflow to Buffalo Bill Res., Wyo.	850	105	
Wind at Dubois, Wyoming	109	110	
Bull Lake near Lenore, Wyoming	183	103	
Tensleep near Tensleep, Wyoming	74	100	
Yellowstone at Miles City, Montana 5/			
Missouri near Williston, N. Dakota 6/			
PLATTE			
North Platte at Saratoga, Wyoming	770	140	
Laramie near Jelm, Wyoming 7/	151	145	
Clear at Golden, Colorado	175	147	
St. Vrain at Lyons, Colorado	100	143	
Cache LaPoudre near Fort Collins, Colorado 8/	300	140	
ARKANSAS			
Arkansas at Salida, Colorado 9/	325	105	
Purgatoire at Trinidad, Colorado	37	80	
RIO GRANDE			
Rio Grande near Del Norte, Colorado 10/	380	87	
Conejos near Mogote, Colorado 11/	135	74	
El Vado Res. Inflow, New Mex. (March-July)	150	80	
Rio Grande at Otowi Bridge, New Mexico 12/(March-July)	410	80	
Pecos at Pecos, New Mexico (March-July)	26	63	
UPPER COLORADO			
Granby Reservoir Inflow, Colorado 13/	290	132	
Colorado at Dotsero, Colorado 14/	1550	113	
Roaring Fork at Glenwood Springs, Colorado 15/	800	116	
Gunnison at Grand Junction, Colorado 16/	1200	106	
Dolores at Dolores, Colorado	190	82	
Colorado near Cisco, Utah 16/ **	2948	105	3359
Flaming Gorge Res., Utah, Net Inflow 17/ **	1168	111	1273
Yampa at Steamboat Springs, Colorado	360	138	
White near Meeker Colorado	390	133	
Duchesne near Tabiona, Utah 18/ **	106	113	138
Whiterocks near Whiterocks, Utah **	41	80	73
Scofield Reservoir, Utah, Net Inflow 19/ **	40	125	60
Green at Green River, Utah 17/ **	3194	124	3404
Navajo Reservoir Inflow, New Mexico	400	65	897
Animas at Durango, Colorado	330	81	
San Juan near Bluff, Utah 20/ **	585	66	1373
Colorado, Inflow to Lake Powell, Arizona 21/ **	7018	108	8162
LOWER COLORADO			
Gila near Solomon, Arizona (January-May)	50	42	58
Salt at Intake, Arizona (January-May)	109	39	389
Verde above Horseshoe Dam, Arizona (January-May)	86	50	354

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) APRIL - SEPTEMBER as of FEBRUARY 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
GREAT BASIN			
Bear at Harer, Idaho	250	111	319
Logan near Logan, Utah 22/ **	99	100	111
Ogden, Inflow to Pine View Res., Utah 23/ **	116	123	155
Weber near Oakley, Utah **	117	107	146
Utah Lake, Utah, Net Inflow **	217	111	263
Big Cottonwood near Salt Lake City, Utah **	39	115	44
Beaver near Beaver, Utah **	24	127	36
Sevier near Hatch, Utah **	27	82	107
Humboldt at Palisades, Nevada **	200	130	363
Truckee at Farad, California 26/ **			
East Carson near Gardnerville, Nevada **			
West Walker near Coleville, California **	160	112	295
UPPER COLUMBIA			
Kootenai at Libby, Montana			
Kootenai at Leonia, Idaho			
Blackfoot near Bonner, Montana			
Flathead near Columbia Falls, Montana 27/			
Flathead near Polson, Montana 27/			
Clark Fork above Missoula, Montana			
Bitterroot near Darby, Montana			
Clark Fork at Plains, Montana 27/			
Columbia at Birchbank, British Columbia 27/			
Spokane at Post Falls, Idaho 28/	2800	89	3440
Columbia at Grand Coulee, Washington 27/			
Okanogan near Tonasket, Washington			
Chelan at Chelan, Washington 29/			
Wenatchee at Peshastin, Washington			
SNAKE			
Snake above Palisades Res., Wyoming 30/	2710	106	
Snake near Heise, Idaho 30/	4100	109	3685
Henry's Fork near Rexburg, Idaho 31/			
Big Lost near Mackay, Idaho 32/	160	95	284
Big Wood, Inflow to Magic Res., Idaho 33/	350	130	630
Bruneau near Hot Springs, Idaho			
Owyhee Res., Net Inflow, Oregon	420	140	741
Boise near Boise, Idaho 34/	2000	129	1987
Malheur near Drewsey, Oregon	120	167	
Payette near Horseshoe Bend, Idaho 35/	2400	131	2086
Snake at Weiser, Idaho			
Salmon at Whitebird, Idaho	7600	111	7230
Clearwater at Spalding, Idaho	8000	93	8380
LOWER COLUMBIA			
Grande Ronde at LaGrande, Oregon	161	92	227
Yakima at Cle Elum, Washington 36/			
Deschutes at Benham Falls, Oregon 37/	510	86	
Columbia at The Dalles, Oregon 27/	94000	89	108959
Hood near Hood River, Oregon 37/	324	96	
Willamette at Salem, Oregon 37/	4575	88	
Lewis at Ariel, Washington 38/			
Cowlitz at Castle Rock, Washington			

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) APRIL - SEPTEMBER as of FEBRUARY 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington			
Rogue at Raygold, Oregon	827	88	1003
Klamath Lake, Net Inflow, Oregon	483	84	656
CALIFORNIA CENTRAL VALLEY 39/ **			
Sacramento, Inflow to Shasta, California	2250	129	2588
Feather near Oroville, California	1950	105	3307
Yuba at Smartville, California	1100	101	1748
American, Inflow to Folsom Res., Calif.	1400	105	2191
Cosumnes at Michigan Bar, California	140	109	230
Mokelumne, Inflow to Pardee Res., Calif.	520	112	882
Stanislaus, Inflow to Melones Res., Calif.	770	108	1392
Tuolumne, Inflow to Don Pedro Res., Calif.	1300	110	2405
Merced, Inflow to Exchequer Res., Calif.	630	105	1379
San Joaquin, Inflow to Millerton Lake, Calif.	1250	107	2898
Kings, Inflow to Pine Flat Res., California	1200	105	3163
Kaweah, Inflow to Terminus Res., California	220	84	807
Tule, Inflow to Success Res., California	45	80	222
Kern, Inflow to Isabella Res., California	410	100	1649

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1916-65.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts Listed on Inside Back Cover.
** April - June Period ** April - July Period.*

quantities of runoff. Percentagewise, the heaviest snowpack (152 percent) is on the main upper Colorado river, with the Yampa-White rivers next (132 percent), followed by the Gunnison river (123 percent). The areas of light snowpack include the San Juan river in southern Colorado (65 percent) and the Virgin-Escalante rivers area of southern Utah. Snow pack in the rest of the basin is generally within 15 percent of average.

The generally near average or above snowpack, combined with soil moisture conditions which are near average or better in most areas, provide an adequate to very good water supply outlook for most of Colorado, Wyoming and Utah. Considerably above average snowfall is needed during the balance of the season on the San Juan and southern Utah drainages if late summer water shortages are to be avoided in areas where reservoir storage is limited or not available.

Storage in irrigation reservoirs is considerably above average, a carryover condition from last year's heavy snowmelt runoff. Storage in Lake Powell and other major reservoirs in the upper basin is increased about 24 percent above a year ago. Storage in Lake Mead is also up, with approximately 1,450,000 acre-feet more than last year at this time. Snowmelt season inflow to Lake Powell (April-July period) is forecast at 108 percent of average.

The water supply outlook for most of Arizona is near normal, due to the very good storage in all major reservoirs. Due to an extremely light snowpack, seasonal runoff is expected to be only about 40 to 50 percent of average on the Salt, Verde and Gila rivers. Flow of the Tonto and Little Colorado rivers will be about 15 to 20 percent average.

The Salt River Project reservoirs, presently containing 66 percent of capacity, are one-third above average. Lake Pleasant and San Carlos reservoirs contain 75 and 100 percent above average amounts of water, respectively. Considerable supplemental pumping will be required along the upper Gila river and on the San Carlos project.

GREAT BASIN

A near average or above snowpack lying on the major watersheds of the Great Basin, combined with well above average carryover reservoir storage, gives promise of a good

water supply for the coming summer.

Snow cover is light on the upper Sevier river in southern Utah. This adverse condition is largely offset, however, by well above average snowpack on the middle and lower watersheds of the system, by above average base flows in the river and excellent reservoir storage. Storage in Otter Creek, Piute and Sevier Bridge reservoirs is twice to three times average.

Snow cover is also light in east central Nevada near Ely and in the White Mountain area of west central Nevada.

January storms were warm throughout the Great Basin, resulting in considerable snowmelt at lower elevations and contributing to higher than normal streamflow and inflow to reservoirs. Temperatures were well above normal, setting several new records at Salt Lake. Storms were frequent for about 20 days during midmonth, with considerable rain at elevations over 7,000 feet.

While the snowpack in the Tahoe-Truckee basin averages 95 percent for this date, it varies from 50 percent normal at lower elevations (6500 feet and lower) to 120 percent normal in the alpine areas.

The Carson and Walker drainages have a snowpack which is 116 percent of normal. This, coupled with the excellent carryover storage in Lahontan, Topaz and Bridgeport reservoirs, insures a good irrigation season on these systems. Snow and soil moisture conditions also are favorable on the Humboldt river, indicating a flow of 130 percent.

Most streams in central and northern Utah are expected to yield average or better flows. Larger streams such as the Weber, Ogden and Provo rivers are forecast to run at about 10 to 25 percent above average. Some of the smaller streams such as East Canyon Creek near Morgan, Hobble Creek near Springville and Hardscrabble Creek near Porterville are forecast at near 140 to 160 percent.

The Bear river in Wyoming, Idaho and Utah, along with most of its tributaries should produce near average to over 125 percent average.

COLUMBIA BASIN

A good to excellent water supply next summer is anticipated throughout most of the United States portion of the Columbia Basin. While near 10 to 20 percent less than normal streamflow is expected in much of British Columbia, northern Washington, Idaho's panhandle and northwest Montana, reservoir storage should furnish adequate supplemental water supplies for most uses.

Mountain snowfall and valley rains were much higher than normal during January throughout most of the United States portion of the basin, and were light in most of British Columbia. Warm temperatures combined with the heavy rainfall depleted much of the low elevation snow cover in Oregon.

Snow accumulation to February 1 has been light in northern regions of the Columbia basin, but becomes progressively heavier in central and southern regions. The snowpack on the Upper Columbia and Kootenai rivers in British Columbia and the Flathead river in Montana varies from about 60 to 80 percent of average.

Percentagewise, snow cover is the greatest in an area encompassing southeastern Oregon, southwestern Idaho and northeastern Nevada. The snowpack here ranges from near 135 percent to over 165 percent of average. This area not only includes the southern tributaries to the Snake river, but the Boise, Payette and Weiser rivers in Idaho, the Malheur, Burnt, Powder and upper John Day rivers in Oregon, and watersheds in the Wenatchee-Yakima area of Washington. The remainder of the basin has a snowpack which is within 20 percent of average.

Soil moisture under the higher elevation snowpacks is still generally below average. In central and southern sections of the basin the rains and snowmelt during January greatly improved soil moisture at the lower elevations. Valley and foothill soils are now well saturated.

Present conditions indicate that streams in Montana will yield between about 80 and 90 percent average flows next summer. In Idaho, about 5 to 10 percent less than average flows are forecast for the Spokane, Clearwater and Big Lost rivers. Forecasts for other central Idaho streams generally range from about 110 to 130 percent normal, with considerably higher flows anticipated from the southern tributaries.

Streams in Oregon expected to yield heavy flows (130 to 170 percent) include the Malheur, Owyhee, Burnt and upper John Day rivers. Most streams in western Oregon should produce within about 5 to 15 percent less than average flows.

In Washington the water supply outlook for irrigation and power in the Columbia basin and on its tributary streams is slightly below normal. Irrigation reservoirs generally have below normal storage, but should fill with the spring runoff.

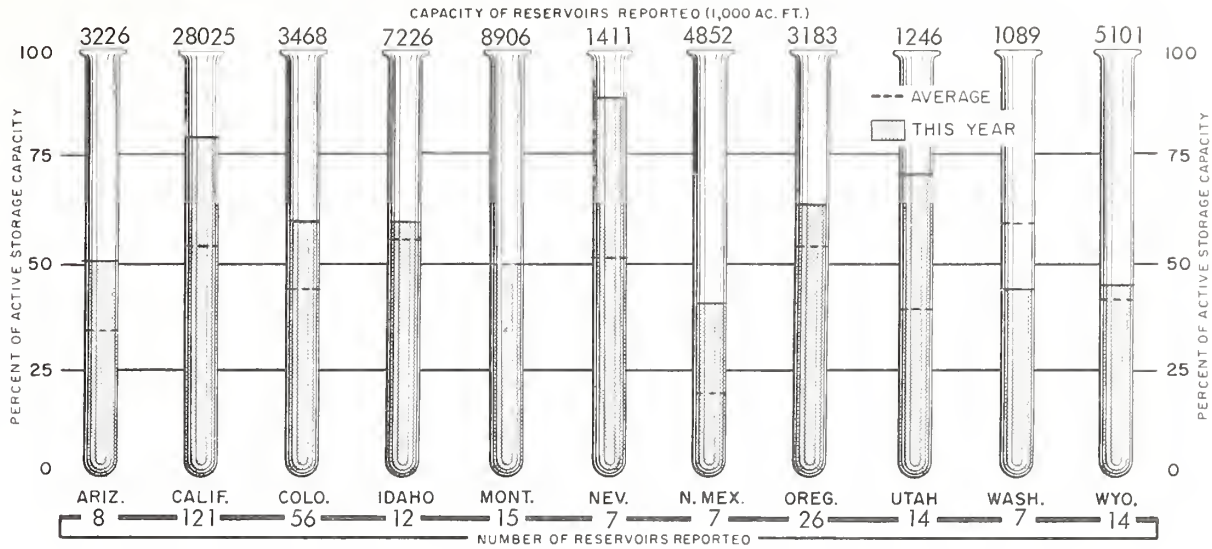
STORAGE IN LARGE RESERVOIRS FEBRUARY 1, 1970

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Belle Fourche	185	83
Boysen	550	363
Buffalo Bill	373	153
Canyon Ferry	2043	1677
Fort Peck	19140	16340
Garrison	24500	18854
Hebgen	377	266
Keyhole	192	111
Lake Francis Case	5816	2943
Lake Sharp	1900	1738
Oahe	23630	19022
Tiber	1347	538
Yellowtail	1356	693
PLATTE		
City of Denver (5)	507	467
Colo-Big Thompson (3)	718	448
Glendo	784	312
Pathfinder	1016	225
Seminoe	1010	399
ARKANSAS		
Conchas	273	230
John Martin	354	40
RIO GRANDE		
Elephant Butte	2195	564
El Vado	195	1
UPPER COLORADO		
Blue Mesa	830	590
Flaming Gorge	3749	1516
Navajo	1696	1012
Powell	25002	9375
LOWER COLORADO		
Havusu	619	543
Mead	27207	16890
Mohave	1810	1648
Salt River Res. (4)	1755	1287
San Carlos	1206	198
Verde River Res. (2)	322	91
GREAT BASIN		
Bear	1421	1121
Lahontan	286	266
Rye Patch	179	160
Sevier Bridge	236	193
Strawberry	274	191
Tahoe	732	700
Utah	884	844
Willard Bay	193	99

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	188
Coeur d'Alene	225	161
Duncan	1347	354
Flathead	1791	1067
Hungry Horse	3428	2026
Kootenay	673	455
Lower Arrow	3083	10
Noxon Rapids	335	320
Pend Oreille	1155	152
Roosevelt	5232	4449
Upper Arrow	4061	0
LOWER COLUMBIA		
Cougar	155	95
Detroit	300	246
Hills Creek	200	138
Lookout Point	337	250
Yakima Res. (5)	1066	458
SNAKE		
American Falls	1700	1243
Anderson Ranch	423	305
Arrowrock	287	266
Brownlee	980	912
Cascade	653	294
Jackson	847	624
Lucky Peak	278	79
Owyhee	715	608
Palisades	1200	872
PACIFIC COASTAL		
Clair Engle	2448	2494
Clear Lake	440	336
Nacimiento	350	84
Ross	1203	849
Upper Klamath	584	503
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	873
Berryessa	1602	1661
Folsom	1010	608
Isabella	570	249
McClure	1026	686
Millerton	521	446
Oroville	3484	2803
Pine Flat	1013	723
Shasta	4500	4037

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

RESERVOIR STORAGE as of FEBRUARY 1, 1970



ALASKA

Relatively mild temperatures and light snowfall has predominated during the early winter months. Most of the interior of the state is very deficient in snow cover. Many of the snow courses measured this month recorded the least amount of snow that has been observed since their records began.

Storms in late February brought considerable snowfall to the coastal drainage near Anchorage and the mountains of southeast Alaska. The snowpack has improved here until it is now near average.

Heavy rains on the Kenai peninsula left the soils well primed. In interior Alaska the precipitation which fell last summer and fall was extremely light, leaving the soils in their present very dry condition. Unless weather patterns change greatly in the next few months, the light snow cover and dry soils indicate that the major portion of Alaska will have limited runoff from the spring snowmelt.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that forecasts based on February 1 snow surveys, and assuming subsequent normal precipitation, indicates the April-July runoff will be near or above normal for snowmelt streams in California. These forecasts and the large carryover from last year virtually assures the availability of near or above average water supplies in most areas. South of the Tehachapi Mountains, runoff is below normal, but with forecasts of normal runoff from sources of import, water supplies for the water year should be adequate.

Precipitation to date ranges from normal to well above normal in areas north of Fresno, California, while to the south it is below normal, averaging less than 50 percent. Statewide, the seasonal precipitation to date is 135 percent of average. The 1969-70 water year began with a single storm period in mid-October. Moderate amounts were reported across the central portion of the State. November precipitation was well below normal except for Southern California where near normal amounts were generally experienced and desert stations received over twice normal amounts. High latitude storm tracks effectively concentrated the storm pattern to Northern California during the wet months of December and January. Three storm periods in December dumped 150 to 200 percent of normal amounts. After a brief ten-day clearing, a persistent troughing situation aloft ushered in twenty consecutive days of moderate to heavy precipitation. Unseasonably warm temperatures throughout the storm period resulted in relatively heavy rainfall at high elevations. Alltime record monthly precipitation totals were reported for January from stations in the vicinity of Shasta Reservoir.

February 1 measurements from some 190 snow courses and 12 reporting snow sensors indicate that the snowpack water content for Cascade and Sierra watersheds was 110 percent of normal for this date and 70 percent of the

April 1 average. The snowpack generally ranged from a high of 145 percent in the Upper Sacramento River watershed to 90 percent of normal in the Kern River Basin. High snowpack density, up to 60 percent, at lower elevation courses reflected the warm rains of January. In Central Sierra watersheds the snowpack deterioration from the warm rains was most evident. The snowpack in the Yuba River Basin, for example, was only 75 percent of the February 1 normal.

Streamflow forecasts for the April-July period, assuming normal precipitation to occur the remainder of the season, indicate Central Valley tributaries will average 110 percent of normal. The Sacramento and San Joaquin Valleys will average 110 and 105 percent of normal, respectively. Water year forecasts for unimpaired runoff of California streams is 145 percent of average. Only the South Coastal area streams are now forecasted for below normal runoff this water year.

Unimpaired runoff of California's major streams was 470 percent of average during January. Only the South Coastal and Central Coastal areas, at 40 and 180 percent of average, respectively, had runoff below 200 percent of normal. In the North Coastal area, Northern Lahontan area, and the Sacramento Valley, hardest hit by the January storms, record and near record flows for the month were experienced. The flooding potential of these flows resulted in a flood emergency being declared on January 27. Reflecting the wetness of the past month, statewide unimpared runoff during the October-January period was 275 percent of average, ranging from 305 percent of average for the San Francisco Bay area to 70 percent of average for the South Coastal area.

On February 1, the aggregate storage in 121 major reservoirs in California, with a combined capacity of 28,025,000 acre-feet, was 22,206,000 acre-feet. This amounts to 143 percent of normal for February 1 and represents a net increase of 3,285,000 acre-feet storage during the past year. Although storage in all hydrographic areas was above normal on February 1, many reservoirs north of the Tehachapi Mountains were still being drawn down to normal flood control levels.

EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
701 N.W. GLISAN, RM. 209
PORTLAND, OREGON 97209

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF AGRICULTURE

FIRST CLASS MAIL

FEDERAL - STATE - PRIVATE

COOPERATIVE SNOW SURVEYS

Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation , navigation , mining and industry

"The Conservation of Water begins with the Snow Survey"